REMARKS

This response is in reply to a second, non-final office action received in this case that was based on newly cited references as discussed below. Claims 1-5 were previously cancelled. Claims 13-23 are newly added. Claims 6-23 remain in the case.

A new drawing page showing Figs. 8-9 is included in keeping with the disclosure (Specification page 7 ll. 4-21). The specification is also amended to include new reference numbers for the referenced elements disclosed in the original specification. Now new matter is added.

The present invention is drawn to a protective packaging system and method whereby a one nanometer protective buffer is achieved using a monolayer of fullerene (C_{60}), a crystalline form of Carbon, to establish the preferred spacing of two components while protecting the components from contacting each other (Specification page 1 ll. 3-7, and 12). The protective buffer can be used to establish the desired one nanometer distance between a microelectromechanical system (MEMS) tunneling tip and a conducting plate (Specification page 3 ll. 11-13 and page 5 ll. 12-16). Once the tunneling tip is positioned at the one nanometer spacing, with only the monolayer of fullerene between the tunneling tip and the conducting plate, the monolayer of C_{60} can be broken down thermally and removed chemically leaving only the tunneling tip and the conducting plate at the ideal tunneling spacing (Specification page 3 line 20 to page 4 line 1 and page 6 ll. 16-18).

Claim 11 was rejected under 35 U.S.C. 112, first paragraph, since it appeared that the specification did not provide a written description of a MEMS device that includes a single event pipe. Applicant respectfully traverses.

As disclosed, a single event pipe is a "pipe channel sealed by a one event valve" (Specification page 7 ll. 7-8 and Figs. 8-9). The single event pipe is used to release a dose amount of carbon-reactive gas to the region between the tunneling tip and the conducting surface to chemically remove the carbon residue (Specification page 3 ll. 20-23 and page 7 ll. 11-19). The single event pipe is well known and commonly fabricated in microelectromechanical systems (Specification page 7 ll. 8-13). The single event pipe is described as supplying the carbon-reactive gas "<u>after the device has reached it destination</u>" when the one event valve is opened (Specification page 6 ll. 2-4 and page 7 ll. 7-13). Opening the one event valve and releasing the carbon-reactive gas when the MEMS device has reached its destination is only possible if the MEMS device, as fabricated, includes the single event pipe. It is well known that single-event pipes including one event valves are commonly fabricated along with a MEMS device. New Figs. 8-9 are added to schematically illustrate the previously disclosed elements.

Claim 11 was rejected under 35 U.S.C. 112, second paragraph, since it appeared that the specification did not clearly describe how the single event pipe and the MEMS device are structurally related. Applicant respectfully traverses.

The single event pipe is described to include a pipe channel containing the carbon-reactive gas, and sealed by a one event valve (Specification page 7 ll. 7-8). The single event pipe is suitably positioned to release the gas to fill the cavity between the conductive surface and the tunneling tip (Specification page 7 ll. 5-13). Claim 11 is drawn to a common single event pipe containing a particular type of gas that reacts with carbon byproducts and not merely to a common single event pipe, but the novelty rests in the combination of the single event pipe containing a particular type of gas in combination with the elements of Claim 7 (Specification

page 7 ll. 8-9). New Figs. 8-9 schematically illustrate the closed and open state of a single event pipe. As disclosed, the single event pipe is located in proximity to the region around the tunneling tip in order to permit the release of any suitable gas that reacts with the carbon byproducts to fill the cavity between the diaphragm and the tip (Specification page 7 ll. 11-13).

Applicant respectfully requests the rejections under 35 U.S.C. 112 be withdrawn.

Claims 6, 7 and 12 were rejected under 35 U.S.C. 102(b) as being anticipated by *Joachim et al.* ("Joachim": A Nanoscale Single-Molecule Amplifier and Its Consequences, Proceedings of the IEEE, Vol. 86, No. 1, January 1998, pages 184-190). Applicant respectfully traverses.

The "adapted to" language, as cited in the office action, has been amended to positively recite the function of the carbon based protective padding "for accurately and reliably establishing a one nanometer spacing". Applicant agrees, as stated in the Office Action, that the phrase "adapted to" does not constitute a limitation in any patentable sense, thereby defining this change to Claim 6 as a non-limiting amendment. Claim 6 is amended to recite the "spacer layer" which functions both in establishing the preferred distance as well as providing a protective padding between the tunneling tip and the conducting surface (Specification page 5 ll. 9-16). Similarly, Claim 12 is amended to recite the "spacer layer" as described.

The device described by Joachim is drawn to a single-molecule <u>amplifier</u> that works by electromechanical modulation (compression) of a single fullerene C_{60} molecule as an active element (Joachim page 184 col. 1 ll. 4-8). Molecules are typically characterized by their occupied and unoccupied electronic states separated by an energy gap (Joachim page 185 col. 1 ll. 41-43). These electronic states are called the Highest Occupied Molecular Orbitals (HOMO) and the Lowest Occupied Molecular Orbitals (LUMO) (Joachim page 185 ll. 43-45). In the

embodiment disclosed by Joachim, a single C_{60} molecule, absorbed on a surface, is electrically contacted by the tip apex of a scanning tunneling microscope (STM) (Joachim page 185 col. 1 ll. 17-20 and page 186 ll. 46-48). The modulation of the C_{60} HOMO-LUMO separation is obtained by actually squeezing (compressing) the C_{60} cage with the tip apex while selecting the bias voltage low enough to maintain the molecule in a pure nonresonant tunneling transport regime (Joachim Fig. 2a, Fig. 3, and page 186 ll. 48-52). Fig 3, as cited in the office action, is actually a circuit diagram of the electromechanical amplifier (Joachim page 186 col. 1 ll. 55-56). Applicant respectfully suggests that Joachim is non-analogous art, and not relevant to the disclosure of the present invention.

Thus, the use of a <u>single</u> fullerene C_{60} molecule in Joachim as an <u>amplifier</u> based on the physical deformation of a single C_{60} molecule is a completely different function from the use of a <u>layer</u> of fullerene C_{60} molecules as a <u>protective padding and spacing device</u> that can be chemically removed once the proper spacing is determined as disclosed in the present invention.

Applicant respectfully requests the rejection be withdrawn.

Claims 6-10 were rejected under 35 U.S.C. 102(b) as being anticipated by *IBM Corp.* ("IBM": IBM Technical Disclosure Bulletin, Vol. 37, No. 1, January 1994, pages 261-262). Applicant traverses this rejection.

The IBM disclosure teaches the fabrication of molecular structures as a step towards the production of logic, information storage, and other structures from organic and biological material (IBM page 261 ll. 1-3). The method includes the formation of self-assembling molecular films in specific locations on a surface by using either scanning tunneling microscopy (STM) or force microscopy (FM) as a lithographic tool (IBM page 261 ll. 3-8). Lithography, in

this case, is borrowed to mean the art of putting a design on a loosely adhering material. In this case, IBM describes applying a single layer of C_{60} or other fullerene onto a substrate, and then the STM or FM tip is used to selectively "push away" weakly bonded fullerene molecules to expose specific locations on the surface of the substrate (IBM page 261 line 10 to page 262 line 3). The substrate with the selectively exposed locations is then immersed in a solution containing self-assembling molecules that can then bond to the selectively exposed regions of the substrate, but not to the fullerene over-layer (IBM page 261 ll. 11-14). The protective fullerene layer is then washed off and what remains is a pattern of self-assembling molecules adhering to the substrate in specific locations that were not covered by a coating of C_{60} (IBM page 261 ll. 5-9). Claims 6-10 are drawn to a carbon based protective padding and physical spacing layer, not a chemical insulation layer to prevent bonding in a specific pattern on a substrate.

The Office Action further states that Claim 8 was rejected since IBM teaches that the conductive surface includes gold. Although IBM does describe gold as "an excellent substrate material" among a variety of metals and semiconductors, IBM does not teach or suggest the function or result of forming a physically protective spacing layer to prevent collision between a tip and a conducting surface, as described in the present invention and the arguments above.

Applicant respectfully requests this rejection be withdrawn.

Claims 6 and 7 were rejected under 35 U.S.C. 102(b) as being anticipated by *Gimzewski et al.* ("Gimzewski": U.S. Patent No. 5,897,954). Applicant traverses this rejection.

The Gimzewski reference is drawn to epitaxially grown layers on a crystalline substrate, in particular providing a structure for compensating lattice mismatches between layers and substrates or between two layers of different materials (Gimzewski col. 1 ll. 5-9). Lattice

mismatch occurs when the top and the bottom layer have different lattice constants (Gimzewski col. 1 ll. 27-29). Deviations of less than 1 percent in the lattice constant between layers readily results in structural defects, including various types of dislocation and the built-up strain in the deposited layer (Gimzewski col. 1 ll. 29-31). These defects often affect the <u>electronic properties</u> of the grown layer in an often undesired manner (emphasis added, Gimzewski col. 1 ll. 31-33). The Office Action states that Gimzewski teaches "a carbon-based protective padding (32) (see Fig. 3) comprising a film of fullerene C_{60} having a thickness of one molecule (see col. 4, lines 39-41)." Applicant respectfully submits that the cited Fig. 3 instead describes a thin-film diode and that reference 32 refers to an electron accepting layer (Gimzewski Fig. 3 and col. 4 ll. 36-43). Rather than teaching a carbon-based protective padding, Gimzewski teaches the use of an epitaxially grown layer of C_{60} fullerene as an electronic component of a diode. In another example, Gimzewski teaches the use of several layers of a different type of conformally adaptive layers as a lubricant in order to reduce the static and sliding friction between two surfaces (Gimzewski Fig. 2 and col. 4 ll. 26-34). In this case, the surfaces are moving laterally relative to each other, and not arranged in a fixed spatial relationship, as in the present invention (Specification page 3 ll. 8-10 and page 6 ll. 16-18). Gimzewski teaches a conformationally adaptive layer formed on a substrate in order to avoid lattice constant mismatch problems, and does not teach or suggest the use of a single layer of C_{60} fullerene as a protective padding and to establish the preferred spacing of adjacent components (Gimzewski Figs. 2-5 and col. 3 ll. 59-61 and Specification page 1 ll. 3-7).

Applicant respectfully requests this rejection be withdrawn.

Claims 8-10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Joachim in View of Applicant's Specification. Applicant respectfully traverses.

As discussed, Joachim discloses the use of a single fullerene C_{60} molecule as an amplifier element based on the physical deformation of a single C_{60} molecule is a completely different function from the use of a layer of fullerene C_{60} molecules as a protective padding and spacing device that can be chemically removed once the proper spacing is determined as disclosed in the present invention. To remove the C_{60} fullerene layer as taught in the present invention would destroy the function of the amplifier taught by Joachim. Applicant respectfully suggests that Joachim is non-analogous art, and cannot properly be cited as rendering the present invention obvious since Joachim does not teach or suggest either a function or result that is relevant to the present invention. Even though Joachim does disclose a single C_{60} molecule interposed between a tip and a conductive surface, the single C_{60} molecule is not used as a protective padding or a spacing element, nor is there any teaching towards the present invention. Claim 8 depends from Claim 7 which depends from Claim 6 which is hereby distinguished over the cited references.

Applicant respectfully requests this rejection be withdrawn.

Relevant Art by the author of a previously cited reference, Gimzewski et al. ("Gimzewski 2": U.S. Published Patent Application 2002/0096633 A1) is discussed as follows.

Gimzewski 2 is drawn to the use of a particular type of molecule as a light emitter in an apparatus comprising two electrodes at a tunneling distance from each other (emphasis added, Gimzewski 2 para. 0001 ll. 1-2 and para. 0013 ll. 1-3). The background of Gimzewski 2 describes how a tip of a scanning tunneling microscope can be used as a local electron source for exciting photon emission from ordered monolayers of C_{60} molecules on an Au surface, and how

the photo emission is strongly suppressed when tunneling through a C_{60} molecule (emphasis added, Gimzewski 2 para. 0005 ll. 4-7 and 14-15). Thus Gimzewski 2 uses this background to describe the creation of light at a higher efficiency than previous methods which used a C_{60} molecule (Gimzewski 2 para. 0006 ll. 1-3). Gimzewski 2 teaches an apparatus that creates light by two processes: <u>stimulating</u> light emission by creating a tunneling current flowing through a layer of molecules, and <u>enhancing</u> light emission by the formation of an electromagnetic cavity between the tip and the substrate (Gimzewski 2 para. 0030 ll. 1-22). The Office Action, in paragraph 8, suggests that Gimzewski 2 teaches "a carbon-based protective padding comprising a film of fullerene C_{60} having a thickness of one molecule,..." Applicant respectfully traverses this interpretation since Gimzewski 2 does not teach the use of a molecule layer as a physical pad or barrier, but only as a light emission source. Also, the only references to a C_{60} fullerene are teaching away from the use of that particular molecule (Gimzewski 2 paragraphs 5 and 40). Two exemplary molecules are described, each having "peripheral entities" or "legs" that hold the central entity of the molecule apart from the surface of the substrate (Gimzewski 2 Figs. 2-3, para. 0031 ll. 5-15 and para. 0047 ll. 1-3). In contrast, the fullerene C_{60} "buckyballs" described in the present invention are spherical in shape, without "legs," and form a physical contact barrier and spacing element between a tip and a conducting surface (Specification page 1 ll. 13-16).

Applicant respectfully submits that Gimzewski 2 is non-analogous art and cannot be properly applied to anticipate or render obvious the claims of the present invention.

New claims 13-22 are supported by the specification as discussed below. No new matter is added.

Claim 13 is drawn to providing a predetermined spacing between a conducting surface and a tunneling tip to form a tunneling device (Specification Figs. 2-7, page 5 ll. 9-18, and page 7 ll. 16). The diaphragm is the substrate including a conducting surface (Specification page 5 ll. 21-23 and page 7 ll. 4-9). The predetermined thickness is preferably one nanometer or the thickness of one layer of C_{60} fullerene (Specification Figs. 2-3 and page 5 ll. 14-16). The tunneling tip is disposed to contact the second side of the spacer layer (Specification Figs. 2-3 and page 3 ll. 13-17).

Claim 14 recites the spacer layer comprises a monolayer of molecules (Specification page 3 ll. 8-10).

Claim 15 recites the predetermined thickness is one nanometer (Specification page 3 ll. 11-13).

Claim 16 recites the spacer layer is C_{60} fullerene (Specification page 3 ll. 8-10).

Claim 17 further recites an energy application member for applying energy to the substrate (Specification page 6 ll. 16-18).

Claim 18 recites that the energy is thermal energy (Specification page 6 line 17 and page 7 ll. 10-11).

Claim 19 recites that the energy is electrical energy (Specification page 6 line 17 and page 7 ll. 10-11).

Claim 20 further recites a single event pipe as previously described (Specification page 7 ll. 11-13).

Claim 21 recites the prefabricated sacrificial surface away from the tunneling device (Specification page 7 ll. 15-19).

Claim 22 recites the gas in the single event pipe reacts with carbon byproducts (Specification page 7 ll. 6-7).

Claim 23 recites the gas in the single event pipe may be oxygen or hydrogen (Specification page 7 line 6).

In view of the foregoing remarks, Applicant submits that the claims are allowable over the cited references and earnestly requests allowance of all pending claims.

If there are any questions with regard to prosecution of this case, the undersigned attorney can be contacted at (818) 354-7770.

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